

WHAT IS CLAIMED IS:

1. A liquid crystal display apparatus having a pair of substrates of which at least one substrate is transparent and a liquid crystal layer sandwiched between the substrates,  
5 comprising:

a plurality of scanning electrodes formed on one of the substrates; and

a plurality of signal electrodes intersecting in a matrix form with said plurality of scanning electrodes;

10 wherein the display apparatus further comprises, within each of the regions surrounded by said plurality of scanning electrodes and said plurality of signal electrodes:

(a) a display data holding circuit connected to a corresponding scanning electrode and signal electrode, for  
15 fetching and storing display data from a signal electrode in response to a scanning signal for holding a display image without updating the display data while a power supply to the display apparatus is maintained;

20 (b) a switching device connected to said display data holding circuit and having a switching operation thereof controlled by the display data holding circuit; and

(c) a display electrode connected to said switching device.

25 2. A liquid crystal display apparatus according to claim 1, wherein an opposed electrode which faces said display electrode is provided on the other substrate of said pair of

substrates, and a common electrode connected to a switching device within each of the regions is provided on one substrate.

3. A liquid crystal display apparatus according to  
5 Claim 1, wherein said switching device for driving pixels is composed of a TFT device: a signal for switching operation is input to a gate terminal of said TFT device, a drain terminal of said TFT device is connected to a display electrode, and a source terminal is connected to a reference line defining an average voltage of a liquid crystal drive voltage; and  
10 including AC voltage generation means for generating a liquid crystal drive voltage and timing signal generation means for generating a timing signal which is synchronized with a time when said liquid crystal drive voltage generated by said AC voltage generation means reaches an average voltage.  
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4. A liquid crystal display apparatus according to  
20 Claim 2, wherein said switching device for driving pixels is composed of a TFT device: a signal for switching operation is input to a gate terminal of said TFT device, a drain terminal of said TFT device is connected to a display electrode, and a source terminal is connected to a reference line defining an average voltage of a liquid crystal drive voltage; and  
25 including AC voltage generation means for generating a liquid crystal drive voltage and timing signal generation means for generating a timing signal which is synchronized with a time

when said liquid crystal drive voltage generated by said AC voltage generation means reaches an average voltage.

5     5.     A liquid crystal display apparatus according to claim 2, wherein said display data holding circuit within each of said regions is connected to said common electrode.

10     6.     A liquid crystal display apparatus according to claim 1, wherein said display data holding circuit includes a thin film transistor having a gate connected to the corresponding scanning electrode and one of a drain and a source connected to the corresponding signal line, and a capacitor connected to the other of the drain and the source of said thin film transistor.

15     7.     A liquid crystal display apparatus according to claim 6, wherein said switching device has a thin film transistor which is connected to the other of the drain and source of said thin film transistor of said display data holding circuit at a gate and to said display electrode at one of the drain and source.

20     8.     A liquid crystal display apparatus according to claim 7, wherein said one of said substrates has a common electrode connected to said capacitor of said display data holding circuit and said thin film transistor of said switching device.

9. A liquid crystal display apparatus according to claim 1, wherein said display data holding circuit includes a thin film transistor which has a gate connected to the corresponding scanning electrode and one of a drain and a source connected to corresponding signal electrode, and a memory circuit connected to the other of the drain and the source of said thin film transistor.

10. A liquid crystal display apparatus having a pair of substrates of which at least one substrate is transparent and a liquid crystal layer sandwiched between the substrates, comprising:

a plurality of first scanning electrodes formed on one of the substrates;

a plurality of signal electrodes intersecting in a matrix form with said plurality of first scanning electrodes;

a plurality of second scanning electrodes provided along said first scanning electrodes or said signal electrodes;

wherein the display apparatus further comprises, within each of the regions surrounded by said plurality of first scanning electrodes and said plurality of signal electrodes:

(a) a data holding circuit connected to a corresponding first scanning electrode, signal electrode, and second scanning electrode for fetching and storing display data from the signal electrode in response to voltages applied to the first and the second scanning electrodes;

(b) a capacitor connected to said data holding circuit;

(c) a switching device connected to said capacitor and having a switching operation thereof controlled by a voltage of the capacitor; and

(d) a display electrode connected to said switching device.

11. A liquid crystal display apparatus according to Claim 10, wherein said switching device for driving pixels is composed of a TFT device: a signal for switching operation is input to a gate terminal of said TFT device, a drain terminal of said TFT device is connected to a display electrode, and a source terminal is connected to a reference line defining an average voltage of a liquid crystal drive voltage; and including AC voltage generation means for generating a liquid crystal drive voltage and timing signal generation means for generating a timing signal which is synchronized with a time when said liquid crystal drive voltage generated by said AC voltage generation means reaches an average voltage.

12. A liquid crystal display apparatus according to claim 11, wherein an opposed electrode which faces said display electrode is provided on the other substrate of said pair of substrates, and a common electrode connected to a switching device within each of the region is provided on the one substrate thereof.

13. A liquid crystal display apparatus according to

claim 12, wherein said display data holding circuit within each of said regions is connected to said common electrode.

14. A liquid crystal display apparatus according to claim 11, wherein each of said data holding circuits comprises:

a first thin film transistor connected to a corresponding first scanning line at a gate thereof and to a corresponding second scanning line at one of a drain and a source thereof; and

a second thin film transistor connected to a corresponding signal electrode at a gate thereof and connected with said first thin film transistor and said capacitor in series.

15. A liquid crystal display apparatus comprising:  
a plurality of scanning electrodes;

a plurality of signal electrodes intersecting with said plurality of scanning electrodes;

a TFT substrate formed with pixel circuits each having at least one display electrode, at respective intersecting points of said scanning electrodes and said signal electrodes;

an opposed substrate formed with a transparent electrode on a surface opposing said TFT substrate; and

a liquid crystal layer disposed between said TFT substrate and said opposed substrate, switching control for an alternating current liquid crystal driving voltage applied to

said transparent electrode being performed by said pixel circuits;

each of said pixel circuits comprising a first pixel circuit consisting of display data holding means, formed with a capacitor connected to at least one TFT element connected to said scanning electrode and said signal electrode, said TFT and a common electrode, for holding display data, and pixel control means formed with at least one pixel driving TFT element connected to said common electrode and said display electrode, and a second pixel circuit including a timing switch means between said display data holding means of said first pixel circuit and said pixel control means;

wherein said first pixel circuit and said second pixel circuit intersect in at least one of horizontal and vertical direction.

16. A liquid crystal display apparatus according to claim 15, wherein a timing for turning said timing switch means of said second pixel circuit ON is set immediately before transition from an upper level voltage to a lower level voltage in a square wave of said liquid crystal driving voltage and immediately before transition from the lower level voltage to the upper level voltage, wherein voltages to be applied to the liquid crystal form timings which are shifted approximately  $180^\circ$  in phase between said first pixel circuit and said second pixel circuit.

